CLAIMS

We claim:

1. A process for preparing submicron sized particles comprising the steps of:

providing a multiphase system having an organic phase and an aqueous phase, the organic phase having a pharmaceutically effective compound therein; and

sonicating the system to evaporate a portion of the organic phase to cause precipitation of the compound in the aqueous phase and having an average effective particle size of less than about 2μm.

2. The process of claim 1, wherein the ratio by weights of the organic phase to the aqueous phase is from about 1:99 to about 99:1.

3. The process of claim 1, wherein the compound is present in an amount by weight of the organic phase from less than about 1% to about 40%.

4. The process of claim 1, wherein the step of sonicating the system comprises the steps of:

providing a sonication device having a transducer for emitting sonic energy; and

exposing the system to said sonic energy sufficient to allow for cavitation to occur.

5. The process of claim 4, wherein the step of sonicating comprises the steps of:

operating the device at a frequency of from about 1 kHz to about 90 kHz.

6. The process of claim 1, further comprising the step of adding a surface active compound to either the organic phase, the aqueous phase or to both the organic phase and the aqueous phase.

7. The process of claim 6, wherein the surface active compound is selected from the group consisting of anionic surfactants, cationic surfactants, nonionic surfactants and biological surface active molecules.

8. The method of claim 7, wherein the nonionic surfactant is selected from the group consisting of: polyoxyethylene fatty alcohol ethers, polyoxyethylene sorbitan fatty acid esters, polyoxyethylene fatty acid esters, sorbitan esters, glycerol monostearate, polyethylene glycols, polypropylene glycols, cetyl alcohol, cetostearyl alcohol, stearyl alcohol, aryl alkyl polyether alcohols, polyoxyethylene-polyoxypropylene copolymers, polaxamines, methylcellulose, hydroxycellulose, hydroxy propylcellulose, hydroxy propylmethylcellulose,

noncrystalline cellulose, polysaccharides, starch, starch derivatives, hydroxyethylstarch, polyvinyl alcohol, and polyvinylpyrrolidone.

9. The method of claim 8, wherein the anionic surfactant is selected from the group consisting of: anionic surfactant is selected from the group consisting of: potassium laurate, triethanolamine stearate, sodium lauryl sulfate, sodium dodecylsulfate, alkyl polyoxyethylene sulfates, sodium alginate, dioctyl sodium sulfosuccinate, phosphatidyl glycerol, phosphatidyl inositol, phosphatidylserine, phosphatidic acid and their salts, glyceryl esters, sodium carboxymethylcellulose, bile acids and their salts, cholic acid, deoxycholic acid, glycocholic acid, taurocholic acid, glycodeoxycholic acid, and calcium carboxymethylcellulose.

10. The method of claim 7, wherein the cationic surfactant is selected from the group consisting of quaternary ammonium compounds, benzalkonium chloride, cetyltrimethyl ammonium bromide, chitosans and lauryldimethylbenzylammonium chloride.

11. The method of claim 2, wherein the surface active biological modifiers are selected from the group consisting of: albumin, casein, heparin, hirudin, or other proteins.

12. The method of claim 1, further comprising the step of: adding a phospholipid to either the organic phase, the aqueous phase or to both the organic phase and the aqueous phase.

13. The method of claim 12, wherein the phospholipid is selected from natural phospholipids and/or synthetic phospholipids.

14. The method of claim 12, wherein the phospholipid is selected from the group consisting of: phosphatidylcholine, phosphatidylethanolamine, phosphatidylserine, phosphatidylinositol, phosphatidylglycerol, phosphatidic acid, lysophospholipids, egg phospholipid and soybean phospholipid.

15. The method of claim 12, wherein further comprising the step of adding a surface-active compound to the system.

16. The method of claim 15, wherein the surfactant is selected from the group consisting of anionic surfactants, cationic surfactants, and biological surface-active molecules.

17. The method of claim 16, wherein the nonionic surfactant is selected from the group consisting of: polyoxyethylene fatty alcohol ethers, sorbitan fatty acid esters, polyoxyethylene fatty acid esters, sorbitan esters, glycerol monostearate, polyethylene

glycols, cetyl alcohol, cetostearyl alcohol, stearyl alcohol, poloxamers, polaxamines, methylcellulose, hydroxycellulose, hydroxy propylcellulose, hydroxy propylmethylcellulose, noncrystalline cellulose, polyvinyl alcohol, polyvinylpyrrolidone, albumin, heparin, and hirudin.

18. The method of claim 16, wherein the anionic surfactant is selected from the group consisting of: potassium laurate, triethanolamine stearate, sodium lauryl sulfate, sodium dodecylsulfate, alkyl polyoxyethylene sulfates, sodium alginate, dioctyl sodium sulfosuccinate, phosphatidyl glycerol, phosphatidyl inositol, phosphatidylserine, phosphatidic acid and their salts, glyceryl esters, sodium carboxymethylcellulose, bile acids and their salts, cholic acid, deoxycholic acid, glycocholic acid, taurocholic acid, glycodeoxycholic acid, and calcium carboxymethylcellulose.

19. The method of claim 16, wherein the cationic surfactant is selected from the group consisting of quaternary ammonium compounds, benzalkonium chloride, cetyltrimethylammonium bromide, chitosans and lauryldimethylbenzylammonium chloride.

20. The method of claim 1, wherein the organic phase comprises a water immiscible solvent.

21. The method of claim 20, wherein the water immiscible solvent is selected from the group consisting of: is selected from the group consisting of: linear, branched or cyclic alkanes with carbon number of 5 or higher, linear, branched or cyclic alkenes with carbon number of 5 or higher, linear, branched or cyclic alkynes with carbon number of 5 or higher; aromatic hydrocarbons completely or partially halogenated hydrocarbons, ethers, esters, ketones, mono-, di- or tri-glycerides, native oils, alcohols, aldehydes, acids, amines, linear or cyclic silicones, hexamethyldisiloxane, or any combination of these solvents

22. The method of claim 21, wherein the water immiscible solvent has a vapor pressure higher than water at room temperature.

23. The method of claim 1, wherein generation of the crude emulsion is accomplished by use of piston gap homogenizers, colloidal mills, high speed stirring, extrusion, manual agitation or shaking, microfluidization, or other high shear conditions.

24. The method of claim 1, wherein the compound is selected from the group consisting of: antihyperlipidemics, anesthetics, antiasthamatics, antimicrobials, antifungals, antineoplastics, non-steroidal anti-inflammatory drugs, antihypercholesteremic agents, analgesics, steroidal compounds, antipyretics, antidepressants, antiarrhthmics, antianxiety

drugs, antimanics, antiarthritics, antihistamines, anti-infectives, water insoluble vitamins, antipsychotics, sedatives, antihypertensive agents, diagnostic agents, anticonvulsants and immunosuppresants.

25. A process for preparing an aqueous suspension of submicron sized particles comprising the steps of:

providing an organic phase of a pharmacologically active compound dissolved in a water immiscible solvent;

providing an aqueous phase;

combining the organic phase with the aqueous phase; and

sonicating the emulsion to cause precipitation of the compound as a suspension of particles in the aqueous phase wherein the aqueous phase is essentially free of the water immiscible solvent.

26. The process of claim 25, wherein the particle is in an amorphous form.

27. The process of claim 26, wherein the particle has an average effective particle size of less than about 2μm.

28. The process of claim 26, wherein the particle has an average effective particle size of less than about 400 nm.

29. The process of claim 26, wherein the particle has an average effective particle size of less than about 300 nm.